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EVALUATION OF DOUGLAS-FIR MORTALITY NEAR FEATHER FALLS, PLUMAS NATIONAL FOREST, CALIFORNIA

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ABSTRACT

Small groups of Douglas-fir mortality have occurred on the Plumas National Forest near Feather Falls, Ca. Invading brush competition following initial tree mortality appears responsible for maintaining conditions favorable for the successful attack by the fir flatheaded borer, Melanophila drummondi. Black stain root disease is a minor mortality factor. Site conditions are discussed and management alternatives are given.

INTRODUCTION

Gregg DeNitto and John Dale accompanied Brad Seaberg and John Fantini, LaPorte Ranger District, Plumas National Forest, to locations in upper Bryant Ravine and Nutmeg Creek (Fig. 1) on January 22-23, 1986. The District was concerned that scattered mortality of small groups of Douglas-fir was the result of root disease centers that would continue to increase in size and impact. A field evaluation was requested to identify any insects and pathogens involved and provide management alternatives to minimize future losses.

FIELD OBSERVATIONS

Douglas-fir occurs at its lower elevational limits near 2500 ft (Fig. 1). However, the upper areas of both drainages receive abundant precipitation from November to April, while the remainder of the year is dry. Ponderosa pine, Douglas-fir and some black oak overtop an understory of Douglas-fir, incense-cedar, madrone and black oak. The dead Douglas-fir occurred singly or in groups of two to six trees in the size classes of sawtimber and large poles. Few saplings were involved. The largest mortality area (Fig. 1, sec. 11) was previously overstocked (more than 250 sq ft BA). The number of stumps at other locations indicated that they may have been overstocked when the initial mortality began with the drought of 1975-1977. However, growth of the remaining dominant Douglas-firs (about 110 years old) has been good, and radial growth (1 and 1/2 inches during the past 10 years) was little affected by the drought. Site quality is rated as a high III, Dunning.

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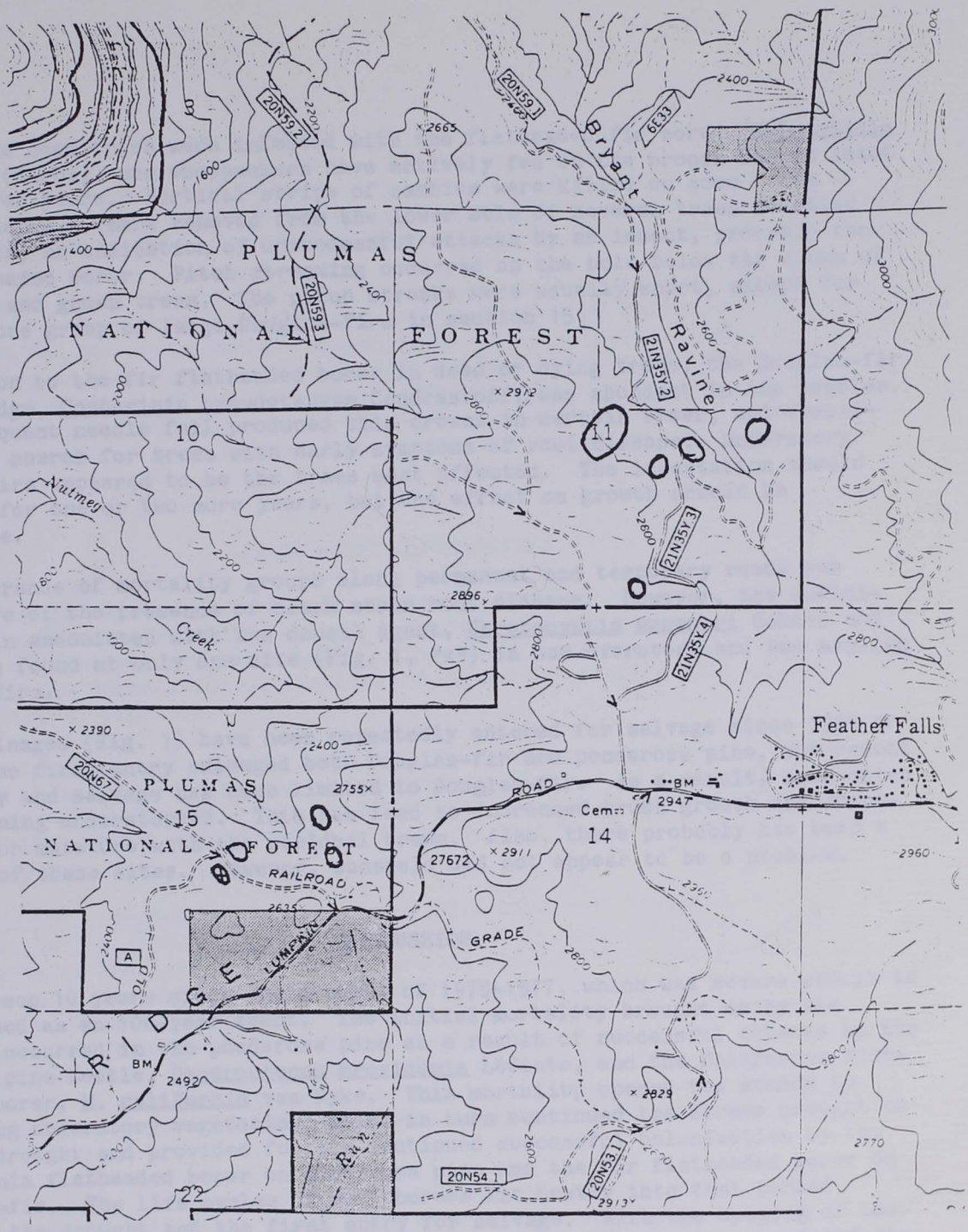

Figure 1. Locations of scattered group mortality of Douglas-fir on the Plumas National Forest near Feather Falls, California.

Many of the dead trees were infested with the flatheaded fir borer, Melanophila drummondi (Kirby), and woodpeckers have actively fed on the broods for at least two to three years. Vertical strips of cambium were killed on some trees -- "strip attacks." Bark removed from the lower bole of several trees revealed resin spots, an indication of unsuccessful attacks by an insect, probably the fir flatheaded borer. Pitch streaming occurred on the bole below the crown of many dead and green trees. The pitch streaks were usually short, except for those of one group of large Douglas-firs in section 15.

In addition to the fir flatheaded borer in dead or dying trees, the Douglas-fir needle midge, Contarinia pseudotsugae Condrashoff, was abundant in the needles. The consequent needle fall produced thin crowns in certain trees, and complicated the search for trees with early symptoms of root disease. Understory Douglas-firs appeared to be the trees most affected. The infestation should continue for one or two more years, but the effect on growth should be negligible.

The appearance of mortality groups along permanent and temporary roads was indicative of the presence of black stain root disease. However, the definitive stain associated with the causal agent, Ceratocystis wageneri Goheen and Cobb, was found at only one site (Fig. 1, "x") in one overstory and two sapling Douglas-firs.

Both drainages (Fig. 1) have been repeatedly entered for salvage since 1980 or 1981. The first entry salvaged both Douglas-fir and ponderosa pine, but recent mortality and salvage has been limited to Douglas-fir. As a result, some sites are becoming understocked. This has lead to increased brush growth and competition for moisture with the residual trees. Also, there probably has been a warming of these sites. However, sunscald did not appear to be a problem.

DISCUSSION

It has been 10 years since the drought of 1975-1977, which was severe enough to be defined as an 100-year event. The initial mortality brought on by the drought occurred in the ponderosa pine as a result of successful attacks by the western pine beetle, Dendroctonus brevicomis LeConte, and the California flatheaded borer, M. california van Dyke. This mortality opened the stands to competing understory vegetation, which in turn continued the stress brought on by the drought and provided for the continued successful colonization by the California flatheaded borer on ponderosa pine and the fir flatheaded borer on Douglas-fir. The life cycles of both borers fit neatly into that period between the drought and the first entry for salvage. With the opening of the canopy through tree mortality and salvage, brush competition increased and the trees remained under stress. At this elevation the pines could recover more quickly than the Douglas-firs from the effects of the drought and competition from the understory vegetation. However, the California flatheaded borer and the western pine beetle remain minor mortality factors in nearby areas. The Douglas-firs remain subject to successful colonization by the fir flatheaded borer. Additional mortality allows for more invasion by pioneer shrub species and increasing amounts of understory vegetation. The continuing competition allows the fir flatheaded borer to eventually overcome additional Douglas-firs until the decline in the basal area offsets the stress induced by the shrub competition. This probably will occur at 65-70% of normal stocking, 170-190 sq

ft/ac, when crown ratios are 50% or more. Until this stocking level occurs, chronic tree mortality will continue. Unpublished observations from the Klamath National Forest tend to support, but not confirm, the sequence outlined (Interim Report, 1977. 5230 Evaluation, Douglas-fir Mortality Problem, Klamath National Forest; on file, Forest Pest Mgmt., Pac. SW Region, San Francisco).

This sequence of events seems to be the most probable explanation for the continued mortality. Root disease was not detected with sufficient frequency to account for the mortality of recent years. At 110 years of age, the Douglas-firs on these low elevation sites may well have reached ecological maturity. The cycle of drought, insect colonization of the large ponderosa pine, and gradual decline of the Douglas-fir may all be part of a process that puts young ponderosa pine back on the sites where it is the most suitable species.

MANAGEMENT ALTERNATIVES

1. No Action. Scattered mortality, primarily Douglas-fir, will continue, especially in overstocked aggregates. The value of any commercial timber will be lost. Understory vegetation will increase in these mortality spots, increasing the competition on residual trees and interfering with natural regeneration of conifers.

2. Expand Salvage. Scattered mortality will continue, however, accessible timber will be removed, thereby recovering some value. Although understory vegetation will increase in the mortality spots, logging activities could reduce this somewhat and scarify the soil, increasing the success of natural regeneration.

3. Patch Cut. Removal of small patches (2-5 acres) of timber in and around active mortality spots would reduce future losses. Continuing this activity in other parts of the area would attain greater productivity from these stands. Regeneration could include ponderosa pine, Douglas-fir, and a small component of rust-resistant sugar pine, if available and desired. This would produce a mosaic of small aggregations of mixed conifer stands over time. Both salvage and sanitation will recover economic values of dead and dying timber. Fewer entries will be required, reducing the amount of logging damage. Stocking levels would be controlled and vegetation managed resulting in healthier, more vigorous trees.

4. Shelterwood. This regeneration system may be more appropriate than patch cuts in visually sensitive areas. The objectives, removing the existing stand and regenerating to a mixed conifer stand, would be the same as with patch cuts. The density of the shelterwood should be the minimum necessary (60-80 sq ft/ac) to assure adequate regeneration of the relatively intolerant ponderosa pine and Douglas-fir. Increasing the density will increase the likelihood of damage to the regeneration when the final cut is made. The shelterwood should be removed as soon as adequate regeneration is assured. This will minimize damage and reduce the impact on the height growth of the regeneration.

5. Commercial Thinning. In overstocked aggregates where regeneration is not appropriate, a commercial thinning to reduce the basal area may reduce the mortality of residual trees. Little, if any, growth response is expected.

Trees selected for removal should be from the lower crown classes. The prescription should attempt to retain a species mix and to achieve a suitable basal area.

6. Vegetation Management. Competing brush vegetation is a significant problem in the area, especially where sunlight hits the forest floor. When utilizing any of the above techniques of regeneration, brush will be a major invader of those areas. Vegetation management to suppress the brush will aid in successful regeneration and will reduce the competitive impact in areas of partial cuts.